Volume - 14 | Issue - 02 | February - 2025 | PRINT ISSN No. 2277 - 8179 | DOI : 10.36106/ijsr

INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH

NUTRIENT POTENTIAL OF THE SEED AND PEEL OF PERSIA AMERICANA FROM SOUTH EAST, NIGERIA.

Biochemistry

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ABSTRACT

Proximate composition, macro mineral and heavy metal of samples were determined using standard methods. Moisture, ash, crude lipid , crude fibre except protein, total carbohydrate and energy content of the seed was significantly ($p < 0.05$) higher than the peel on dry weight basis . Potassium (136.16mg/ kg ; 67.19mg/ kg) had the highest concentration in both samples while sodium had the lowest concentration (1.24mg/ kg ; 0.32mg/ kg) . Sodium and potassium except calcium, magnesium and phosphorus were significantly higher ($p<0.05$) in the seed than in the peel . The K to Na ratio was greater than 1. Copper, iron, manganese except chromium in the seed were significantly higher ($p<0.05$) than in the peel. Comparing the levels of essential heavy metals and non-essential heavy metals in the seed and peel samples to the FAO/WHO maximum permissible values, copper, iron, cadmium, and zinc were found to be lower but manganese, chromium and lead were found to be higher. Our study revealed that P.americana seed is richer in ash, crude lipid, crude fibre than the peel while the peel is richer in crude protein, total carbohydrate and energy than the peel but both are rich in K, Ca, Mg, P,Cu,Fe,Mn,Cr , and zinc but low in Na and Cd . The study scientifically justifies that the seed and peel are possess nutritional potential.

KEYWORDS

Heavy Metal, Macro-mineral , Nutritional Potential, Persia Americana Seed And Peel, Vitamin.

INTRODUCTION

Our study was aimed to evaluate the nutrient potential of the seed and peel of Persia americana (Avocado) fruit in South-east, Nigeria. Persia Americana is a dicotyledonous, tropical flowering plant belonging to the family of Lauraceae (FAO, 2018). Avocado fruit is rich in bioactive compounds and possess lots of health benefits (Araujo et al.,2018 ; Migliore et al., 2018) . Large amount of avocado fruit are produced and processed every year around the world and the seed and peel generated are usually discarded as waste without any further processing and application (Akon, 2012) , meaning that the by-products of avocado has not been effectively managed and the resultant effect is environmental pollution . (Figueroa et al., 2028 ; Araujo et al.,2018). In South East Nigeria, people consume only the pulp and throw away the seed and peel as waste. The plant is therefore under-utilized . Recently, people around the world have developed significant interest in the utilization of avocado as functional ingredient of their food probably because of their richness in bioactive compounds such as dietary fiber, vitamins, fatty acids and phytochemical (Kosinska et al., 2012 ; Saavedra et al.,2017). Seeds of avocado make up about 13% to 17% of the fruit and they are rich in nutrients and bioactive substances such as proteins, starch, lipids, crude fiber, vitamins, minerals, and a lot of phytochemicals . Avocado peel has also been reported to be rich in phytochemicals which are called health promoters that can be used to make high economic value products (Banger et al., 2022). Nutritional information highlighted in the study is significant because it will educate the people of the region on the nutritional benefits of the seed and peel of Avocado fruit.

METHODOOGY

Procurement of Materials/Sample preparation: We procured 20 Avacado fruits, identified them with voucher number UPH/24/06 at Department of Plant Science and Biotechnology, University of Port Harcourt. They were neatly packaged and transported to the Department of Biochemistry, Gregory University, Uturu, Abia State for sample preparation . The seed and the peel were separated from the fruit , washed, cut into small sizes , and air dried for 3 weeks. The dried samples were ground into flour using a blender and 400g of each sample were weighed using chemical balance , packaged in clean plastic air-tight container, labeled and stored at room temperature for laboratory analysis.

Experimental design: We adopted experimental research design . Proximate , mineral analysis of the seed and peel were determined as described by the Association of Official Analytical Chemists (AOAC, 2023). Sodium to potassium ratio was estimated using calculation.

RESULTS AND DISCUSSION

Proximate Composition (%) and Calorific values of the Seed and Peel of Persia americana:

Moisture, ash, crude fibre, and crude lipid content of the seed (Table 1) was significantly($p < 0.05$) higher than the peel on dry weight basis . The moisture content of Calliandra surinamensis seed (Irabor et al ., 2023) was higher than the value for the seed and peel of P.americana revealed in this study. Moisture in food could be used to determine food stability against microbial contamination (Uraih and Izuagbe , 1990) . Lower value of ash for Prosopis africana seed was reported (Okoroh and Onuoha , 2019) . Ash reflects level of minerals . Our lipid content was comparable to that reported for A.garckeana seed (Sirajo et al ., 2022) . Seeds are good sources of oils rich in unsaturated fatty acids which health experts presume to be aid heart health (Hu and Willet, 2002) . Our fibre content was lower than that of the seed and peel of A.garckeana (Sirajo et al ., 2022) but (Okoroh and Onuoha, 2019), reported higher crude fiber for seeds of A.hypogea and A.occidentale. Fibre is good for food digestion and bowel movement .The protein, total carbohydrates and energy content of the peel was significantly higher than that of the seed ($p < 0.05$). Protein content we highlighted in this study was lower than the values reported for A.hypogea and A.occidentale (Okoroh and Onuoha, 2019). Proteins build cells and tissues and promote growth and development as well as tissue repair. Total carbohydrate in lime seed and peel (Uzama et al ., 2021) was lower than our value . Carbohydrates are good sources of energy. Higher energy values were reported for processed seeds of A.hypogea and A.occidentale (Okoroh and Onuoha ., 2019) than our values in this sudy.

Table 1: Proximate Composition (%) and Calorific values of the Seed and Peel of Persia americana

Parameter	Seed	Peel
Ash (%)	6.88 ± 0.02a	5.71 ± 0.03b
Moisture (%)	8.94 ± 0.03a	2.19 ± 0.02b
Crude Lipid (%)	11.48 ± 0.03a	4.94 ± 0.02b
Crude Fiber (%)	7.45 ± 0.04a	1.69 ± 0.02b
Crude Protein (%)	4.27 ± 0.04a	7.15 ± 0.02b
Carbohydrate (%)	61.07 ± 0.15a	78.31 ± 0.04b
Calorific value (g/kcal)	364.70 ± 0.48a	386.34 ± 0.05b

Keys: Data reported as mean ± standard deviation of triplicate determinations, values bearing different superscripts on the same row differ significantly ($p<0.05$), while ones with the same superscripts indicate no significant difference ($p>0.05$) using Independent Sample t- test.

Macromineral Concentration of the seed and peel of Persia Americana Sodium and potassium were significantly higher ($p<0.05$) in the seed than in the peel but the value of sodium reported for seeds of C.lanatus (Okoroh et al., 2021) was higher. Sodium and potassium are important intracellular and extracellular ions. Potassium helps to maintain electrolyte balance and membrane fluidity (Mikko et al., 2006) .

Calcium, magnesium and phosphorus were significantly ($p<0.05$) higher in the peel than in the seed but a lower value was reported for C.lanatus seeds (Okoroh et al ., 2021). Calcium builds and maintains bone mass while its lack causes bone malformation. Magnesium aids metabolism, specific neuro-muscular activities etc. Phosphorus regulate ionic balance in blood and tissues. It is an essential element for normal functioning of kidney and also aid in transmission of nervous impulse (Ahmed and Chandhary, 2009). The K to Na ratio of the seed and the peel of Avocado was found to be greater than 1 and higher than that reported for C.lanatus seed (Okoroh et al ., 2021) .

Table 2: Macro Mineral Concentration Of The Seed And Peel Of Persia Americana

Minerals (mg/kg)	Seed	Peel
Sodium (Na)	1.24 ± 0.02a	0.32 ± 0.02b
Potassium (K)	136.16 ± 0.02a	67.19 ± 0.02b
Calcium (Ca)	11.38 ± 0.02a	28.49 ± 0.02b
Magnesium (Mg)	9.48 ± 0.02a	17.63 ± 0.02b
Phosphorus (P)	6.85 ± 0.02a	10.14 ± 0.02b
K/Na ratio	109.8	209.8

Keys: Data reported as mean ± standard deviation of triplicate determinations, values bearing different superscripts on the same row differ significantly ($p<0.05$), while ones with the same superscripts indicate no significant difference ($p>0.05$) using Independent Sample t- test.

Heavy Metal concentrations of the seed and peel of Persia Americana. We discovered the levels of Cu,Fe,Mn, Zn except chromium in the seed to be significantly higher ($p<0.05$) than in the peel . Comparing the levels heavy metals in the seed and peel samples with the FAO/WHO maximum permissible values, Cu, Fe, Cd, and Zn except Mn, Cr and Pb concentrations were found to be lower . The values of Cu, Zn, Fe and Mn reported by (Olaniyi et al ., 2018) for leaves of C.cujete was higher than the values we had for these minerals in the seed and peel of P.americana analyzed. Copper is essential in Redox reactions, component of enzymes such as ceruloplasmin, an electron transporter (cytochrome c oxidase). Zinc is vital for growth and development during pregnancy, from childhood to adulthood (Das and Das , 2012). Manganese plays the role as catalyst and cofactor in enzymatic processes such as cholesterol and fatty acid , mucopolysaccharides and glycoprotein biosynthesis (Ghani et al ., 2013)

Table 4: Heavy Metal Concentrations Of The Seed And Peel Of Persia Americana

Mineral(mg/kg)	Seed	Peel
Copper (Cu)	8.29 ± 0.02a	5.17 ± 0.02b
Iron (Fe)	9.50 ± 0.02a	7.05 ± 0.02b
Manganese (Mn)	5.89 ± 0.02a	3.47 ± 0.02b
Chromium (Cr)	4.15 ± 0.02a	6.00 ± 0.02b
Cadmium (Cd)	0.08 ± 0.02a	0.04 ± 0.02a
Lead (Pb)	3.86 ± 0.02a	2.01 ± 0.02b
Zinc (Zn)	6.22 ± 0.02a	4.68 ± 0.02b

Keys: Data reported as mean ± standard deviation of triplicate determinations, values bearing different superscripts on the same row differ significantly ($p<0.05$), while ones with the same superscripts indicate no significant difference ($p>0.05$) using Independent Sample t- test

CONCLUSION

Our study revealed that P.americana seed is richer in ash, crude lipid, crude fibre than the peel while the peel is richer in crude protein, total carbohydrate and energy than the peel but both are rich in K, Ca, Mg, P, Cu, Fe, Mn, Cr , and zinc although have low levels of Na and Cd . This scientifically justifies that the seed and peel possess nutrient potential.

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